

## CLAIMS

- 1 1. An apparatus for simulating a back and forth leg or foot movement, the apparatus  
2 comprising:  
3 a pair of pivotable support mechanisms supported on a frame,  
4 a pair of foot pedals mounted on the support mechanisms for back and forth  
5 movement along an arcuate path of translation movement,  
6 wherein the pedals have a generally planar foot sole receiving surface and  
7 wherein the foot pedals are pivotably mounted in an arrangement on the support  
8 mechanisms such that the sole receiving surfaces of the foot pedals pivot or  
9 rotate less than about three degrees during the back and forth movement of the  
10 support mechanisms.
- 1 2. The apparatus of claim 1 wherein the foot pedals are mounted in an arrangement  
2 on the support mechanisms such that the sole receiving surfaces remain  
3 generally coplanar with a fixed reference plane during the back and forth  
4 movement of the support mechanisms.
- 1 3. The apparatus of claim 1 wherein the pair of pivotable support mechanisms  
2 comprise four bar linkage mechanisms.
- 1 4. The apparatus of claim 1 wherein the path of translation movement of a foot  
2 pedal is the same from back to front and front to back..
- 1 5. The apparatus of claim 1 wherein the pedals are interconnected to a pivot  
2 mechanism adjustable to a selected degree of pivot that adjusts the arcuate path  
3 of translation movement of the foot pedals.

- 1 6. An apparatus for simulating a back and forth leg or foot movement, the apparatus  
2 comprising:  
3 a pair of pivotable support mechanisms supported on a frame,  
4 a pair of foot pedals mounted on the support mechanisms for back and forth  
5 movement along an arcuate path of translation movement, the foot pedals being  
6 adjustable to a selected arcuate path of translation movement,  
7 wherein the foot pedals rotate less than about three degrees during the back and  
8 forth movement of the support mechanisms.
- 1 7. The apparatus of claim 6 wherein the path of translation movement of a foot  
2 pedal is the same from back to front and front to back.
- 1 8. The apparatus of claim 6 wherein the pair of pivotable support mechanisms  
2 comprise four bar linkage mechanisms.
- 1 9. The apparatus of claim 6 wherein the foot pedals are interconnected to a pivot  
2 mechanism adjustable to a selected degree of pivot that adjusts the arcuate path  
3 of translation movement of the foot pedals.
- 1 10. An apparatus for simulating a back and forth leg or foot movement comprising:  
2 a pair of left and right foot pedals each having a foot sole receiving surface,  
3 the foot pedals being mounted on a frame for movement in a back and forth  
4 direction along an arcuate path between forwardmost and rearwardmost  
5 positions;  
6 a pair of left and right manually graspable input arms each pivotably  
7 interconnected to a respective one of the left and right foot pedals such that the  
8 left arm pivots forwardly together with forward movement of the left pedal, the left  
9 arm pivots rearwardly together with backward movement of the left pedal, the right

10 arm pivots forwardly together with forward movement of the right pedal and the  
11 right arm pivots rearwardly together with backward movement of the right pedal.

1 11. The apparatus of claim 10 wherein the foot pedals are adjustable to move in an  
2 arcuate path of selected incline.

1 12. The apparatus of claim 10 wherein the input arms are adjustable to move in a  
2 pivot path of selected degree of pivot.

1 13. The apparatus of claim 10 wherein the pedals and the input arms are  
2 interconnected to a pivot mechanism adjustable to a selected degree of pivot that  
3 adjusts the arcuate path of the foot pedals and the degree of pivot of the input  
4 arms.

1 14. The apparatus of claim 10 wherein the arms and the pedals are interconnected  
2 to a reciprocating mechanism that directs one of the left or right pedals to travel  
3 in the back or forth direction while simultaneously directing the other of the left or  
4 right pedals to travel in an opposite direction.

1 15. The apparatus of claim 10 wherein the arms and the pedals are interconnected  
2 to a reciprocating mechanism that directs one of the left or right pedals to travel  
3 in the back or forth direction while simultaneously directing the other of the left or  
4 right pedals to substantially always travel in an opposite direction.

1 16. The apparatus of claim 14 wherein the reciprocating mechanism comprises a  
2 rotating mechanism having a pair of pivot points, one pivot point pivotably  
3 interconnected to one of the left or right pedals and arms and the other pivot

4 point pivotably interconnected to the other other of the left or right pedals and  
5 arms.

1 17. The apparatus of claim 14 wherein the pivot points are disposed at substantially  
2 opposing 180 degree positions along a circular path of rotation, the pedals and  
3 the arms being interconnected to a respective pivot point by a link mechanism.

1 18. The apparatus of claim 10 wherein the foot pedals pivot or rotate less than about  
2 three degrees during movement between the forwardmost and backwardmost  
3 positions.

1 19. The apparatus of claim 10 wherein each of the foot pedals are mounted on the  
2 frame via a four bar linkage mechanism.

1 20. An apparatus for simulating a back and forth leg or foot movement comprising:  
2 a pair of left and right foot pedals each having a foot sole receiving surface,  
3 the foot pedals being mounted on a frame by linkages for movement in a back-  
4 and forth direction along an overall arcuate path defined by the linkages;  
5 a pair of left and right manually graspable input arms each pivotably  
6 interconnected to a respective one of the left and right foot pedals for pivoting  
7 movement in the back or forth direction;  
8 wherein the foot pedals are adjustable to move along a selected segment of the  
9 overall arcuate path between forwardmost and backwardmost positions, the  
10 selected segment of the overall arcuate path being variably selectable by the  
11 user to have a variable degree of incline.

- 1 21. The apparatus of claim 20 wherein the foot sole receiving surfaces pivot or rotate  
2 less than about three degrees between the forwardmost and backwardmost  
3 positions.
- 1 22. The apparatus of claim 20 wherein the left arm pivots forwardly together with the  
2 forward movement of the left pedal, the left arm pivots rearwardly together with  
3 backward movement of the left pedal, the right arm pivots forwardly together with  
4 forward movement of the right pedal and the right arm pivots rearwardly together  
5 with backward movement of the right pedal.
- 1 23. The apparatus of claim 20 wherein the linkages comprise a four bar linkage  
2 mechanism.
- 1 24. An apparatus for simulating a back and forth leg or foot movement comprising:  
2 a pair of foot pedals each having a foot sole receiving surface,  
3 the foot pedals being mounted on a frame for movement in a back and forth  
4 direction along an arcuate path between forwardmost and rearwardmost  
5 positions;  
6 a pair of manually graspable input arms each pivotably interconnected to a  
7 respective one of the foot pedals for pivoting movement in the back or forth  
8 direction;  
9 wherein the arms and the pedals are interconnected to a control mechanism that  
10 directs one interconnected arm and pedal to travel in the back or forth direction  
11 while simultaneously directing the other interconnected arm and pedal to travel in  
12 an opposite direction.

1 25. An apparatus for simulating a back and forth leg or foot movement, the  
2 apparatus comprising:  
3 a pair of left and right four bar linkage support mechanisms supported on  
4 a frame for back and forth pivoting movement, each four bar linkage  
5 mechanism comprising a pair of opposing forward and rearward pivot links  
6 each having a length and a pair of opposing upper and lower pivot links  
7 each having a width;  
8 wherein the lower pivot link of each four bar linkage mechanism comprises  
9 a foot pedal for back and forth movement along an arcuate path of  
10 translation movement,  
11 wherein the lengths of the forward and rearward links are substantially  
12 equal to each other and the  
13 widths of the upper and lower pivot links are substantially equal to each  
14 other.

1 26. The apparatus of claim 25 wherein the foot pedals are interconnected to a  
2 control mechanism that is adjustable to select an arcuate path of  
3 selectable incline.

1 27. Method for performing a back and forth leg, foot and upper body exercise  
2 by a subject on an exercise apparatus, the method comprising:  
3 positioning the soles of the feet of a subject on a pair of left and right foot  
4 pedals adapted to be moved in a back and forth motion along arcuate  
5 paths of translation;  
6 the left and right foot pedals being respectively interconnected to left and  
7 right manually graspable arms, each arm being adapted to pivot forwardly  
8 together with forward movement of its respectively interconnected foot  
9 pedal and to pivot backwardly together with backward movement of its  
10 respectively interconnected foot pedal;

11 wherein the subject positions a right or left foot on a respective one of the  
12 right or left pedals; and  
13 wherein the subject exerts sufficient energy to move a respective one of  
14 the left or right pedals forwardly or backwardly and to simultaneously pivot  
15 a respective one of the left or right arms forwardly or backwardly.

1 28. The method of claim 27 wherein the subject selects the degree of incline,  
2 of the arcuate paths of translation of the foot pedals.

1 29. Method for performing a back and forth leg, foot and upper body exercise  
2 by a subject on an exercise apparatus, the method comprising:  
3 positioning the soles of the feet of a subject on a pair of left and right foot  
4 pedals adapted to be moved in a back and forth motion along arcuate  
5 paths of translation;  
6 the left and right foot pedals being respectively interconnected to left and  
7 right manually graspable arms, each arm being adapted to pivot forwardly  
8 together with forward movement of a respectively interconnected foot  
9 pedal and to pivot backwardly together with backward movement of its  
10 respectively interconnected foot pedal;

11 wherein the subject positions a right or left foot on a respective one of the  
12 right or left pedals; and

13 wherein the subject exerts sufficient energy with a respective one of the  
14 subject's left or right arms to push or pull a respective one of the left or  
15 right arms forwardly or backwardly and to simultaneously move a  
16 respective one of the left or right pedals forwardly or backwardly.

1 30. The method of claim 29 wherein the subject selects the degree of incline,  
2 of the arcuate paths of translation of the foot pedals.

1 31. Method for performing a back and forth leg, foot and upper body exercise  
2 by a subject on an exercise apparatus, the method comprising:  
3 positioning the soles of the feet of a subject on a pair of foot pedals  
4 adapted to be moved in a back and forth motion along arcuate paths of  
5 translation;  
6 the foot pedals being interconnected to a frame of the apparatus such that  
7 the foot pedals rotate or pivot less than about 3 degrees during movement  
8 in the back and forth motion;  
9 wherein the subject exerts energy to move one of a left or right foot  
10 forward while standing on one pedal and simultaneously exerts energy to  
11 move the other of the left or right foot backwardly while standing on the  
12 other pedal.

1 32. The method of claim 31 wherein the subject selects the degree of incline,  
2 height, length, depth or curvature of the arcuate paths of translation of the  
3 foot pedals.

1 33. The method of claim 31 wherein the apparatus includes a pair of arms  
2 interconnected to a respective one of the foot pedals for simultaneous  
3 back and forth movement of the interconnected arms and foot pedals, the  
4 method further comprising the subject pushing on one of the arms that is  
5 interconnected to the one foot pedal that the subject exerts energy to  
6 move forward and wherein the subject pulls on the other arm that is  
7 interconnected to the other pedal that the subject exerts energy to move  
8 backward.

1 34. Method for performing a back and forth leg, foot and upper body exercise  
2 by a subject on an exercise apparatus, the method comprising:



3 positioning the soles of the feet of a subject on a pair of left and right foot  
4 pedals adapted to be moved in a back and forth motion along arcuate  
5 paths of translation;  
6 the left and right foot pedals being respectively interconnected to left and  
7 right handles for grasping by a user, each handle being adapted to pivot  
8 forwardly together with forward movement of its respectively  
9 interconnected foot pedal and to pivot backwardly together with backward  
10 movement of its respectively interconnected foot pedal;  
11 wherein the subject positions a right or left foot on a respective one of the  
12 right or left pedals; and  
13 wherein the subject exerts sufficient energy with a respective one of the  
14 subject's left or right hands to push or pull a respective one of the left or  
15 right handles forwardly or backwardly and to simultaneously move a  
16 respective one of the left or right pedals forwardly or backwardly.

1 35. The method of claim 34 wherein the subject selects the degree of incline,  
2 of the arcuate paths of translation of the foot pedals.

1 36. An apparatus for simulating a back and forth leg or foot movement  
2 comprising a pair of left and right foot pedals each having a foot sole  
3 receiving surface, the foot pedals being mounted on a frame for movement in  
4 a back and forth direction along an arcuate path between forwardmost and  
5 rearwardmost positions;  
6 a pair of left and right handles for being grasped by a user's hands each  
7 pivotably interconnected to a respective one of the left and right foot pedals  
8 such the left handle pivots forwardly together with forward movement of the  
9 left pedal, the left handle pivots backwardly together with backward  
10 movement of the left pedal, the right handle pivots forwardly together with

- 11 forward movement of the right pedal and the right handle pivots backwardly
- 12 together with backward movement of the right pedal.